

Unit of Calif.

SEMIANNUAL REPORT

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The end-loaded high pressure chamber design discussed in the last report proved to be very troublesome. Investigation of the frequent core failures indicated that the small hole drilled in the chamber to serve as a gas inlet produced micro fractures in the very hard metal, which spread throughout the chamber with the application of internal pressure.

A new "two unit" higher pressure chamber has been designed to overcome this difficulty. It consists of a relatively soft steel lower portion with the gas inlet fittings and a hard section that serves as the high pressure working area of the chamber. The new design retains the end-loaded feature.

The new core has been installed in the press and tested to 40 kb with no failures.

Exploration of the melting curves of argon, carbon dioxide, ammonia, and methane is now in progress in the region beyond 20 kb and in the 200°C + region. This work should be completed within a few months. Initial experiments have also been conducted on nitrogen.

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A number of attempts to investigate the suspected solid-solid transitions in carbon dioxide and ammonia by methods discussed in the last report have been found to be unsuccessful. Therefore, a new stainless steel capsule has been designed that will enable the gas to be held in the solid state at room temperature, and experiments to conduct differential thermal analyses on these substances will be initiated in the very near future.

Recent investigations in this laboratory have indicated that there is a direct relationship between the compressibility of a solid and its melting temperature at any given pressure according to the relation

$$d \left[1 - V_{PT} / V_O \right] / dT = K \quad .$$

Data and calculations are now being collected to determine the compressibility of various gases from experimental melting curve data.

